

钍地半导体
Tudi Semiconductor

Product Specification

TUDI-DS34C87T

CMOS Quad TRI-STATE Differential Line Driver

网址 www.sztdbdt.com

用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

FEATURES

- ●TTL Input Compatible
- ●Typical Propagation Delays:6ns
- ●Typical Output Skew:0.5ns
- ●Outputs Won't Load Line When Vcc=OV
- VMeets the Requirements of EIA Standard RS-422
- ●Operation from Single 5V Supply
- ●TRI-STATE Outputs for Connection to System Buses
- ●Low Quiescent Current
- ●Available in Surface Mount

DESCRIPION

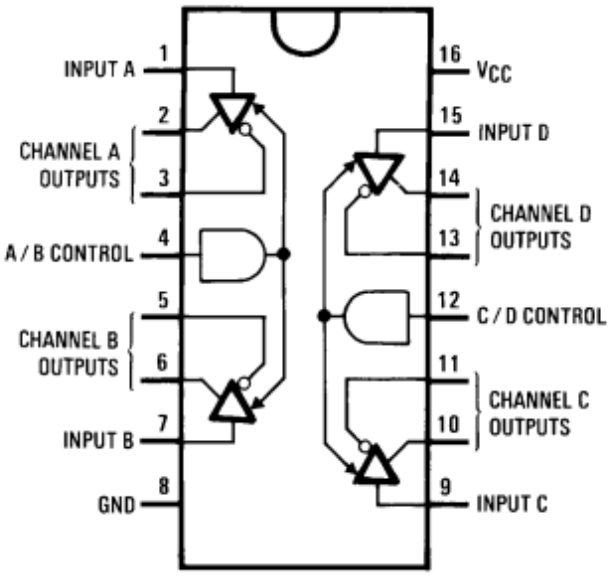
The DS34C87T is a quad differential line driver designed for digital data transmission over balancedlines.The DS34C87T meets all the requirements ofEIA standard RS-422 while retaining the low powercharacteristics of CMOS.This en ables the construction of serial and terminal interfaces while maintaining minimal power consumption.

The DS34C87T accepts TTL or CMOS input levelsand translates these to RS-422 output levels.Thispart uses special output circuitry that enables the individual drivers to power down without loading downthe bus.This device has separate enable circuitry foreach pair of the four drivers.The DS34C87T is pin compatible to the DS3487T.

All inputs are protected against damage due to electrostatic discharge by diodes to V_{cc} and ground.

Connection and Logic Diagrams

Top View



See PIN DESCRIPTIONS for details.

Figure 1. PDIP Package
See Package Numbers D0016A or NFG0016E

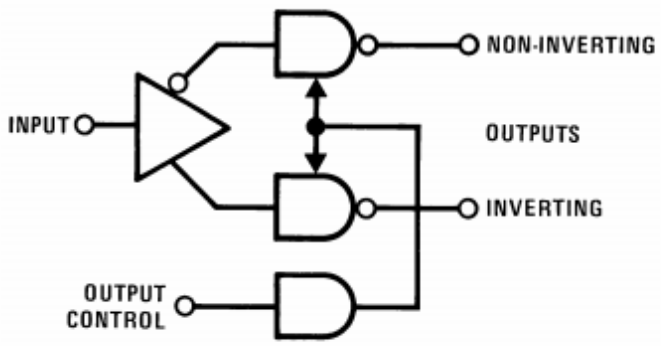


Figure 2. Logic Diagram

Truth Table(1)

Input	Control	Non-Inverting	Inverting
	Input	Output	Output
H	H	H	L
L	H	L	H
X	L	Z	Z

(1) L = Low logic state
H = High logic state
X = Irrelevant
Z = TRI-STATE (high performance)

Absolute Maximum Ratings(1)(2)(3)(4)

Supply Voltage (V_{CC})	−0.5 to 7.0V
DC Voltage (V_{IN})	−1.5 to V_{CC} +1.5V
DC Output Voltage (V_{OUT})	−0.5 to 7V
Clamp Diode Current (I_{IK} , I_{OK})	±20 mA
DC Output Current, per pin (I_{OUT})	±150 mA
DC V_{CC} or GND Current (I_{CC})	±150 mA
Storage Temperature Range (T_{STG})	−65°C to +150°C
Maximum Power Dissipation (P_D) @ 25°C(5)	
PDIP Package	1736 mW
SOIC Package	1226 mW
Lead Temperature (T_L)	
(Soldering 4 sec)	260°C
This device does not meet 2000V ESD rating.(6)	

(1) Unless otherwise specified, all voltages are referenced to ground. All currents into device pins are positive; all currents out of device pins are negative.
(2) Absolute Maximum Ratings are those values beyond which the safety of the device cannot be specified. They are not meant to imply that the device should be operated at these limits. The table of "Electrical Characteristics" provide conditions for actual device operation.
(3) ESD Rating: HBM (1.5 kΩ, 100 pF) Inputs ≥ 1500V Outputs ≥ 1000V EIAJ (0Ω, 200 pF) All Pins ≥ 350V
(4) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/ Distributors for availability and specifications.
(5) Ratings apply to ambient temperature at 25°C. Above this temperature derate NFG0016E Package 13.89 mW/°C, and D0016A Package 9.80 mW/°C.
(6) ESD Rating: HBM (1.5 kΩ, 100 pF) Inputs ≥ 1500V Outputs ≥ 1000V EIAJ (0Ω, 200 pF) All Pins ≥ 350V

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	4.50	5.50	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temperature Range (T_A) DS34C87T	−40	+85	°C
Input Rise or Fall Times (t_r, t_f)		500	ns

DC Electrical Characteristics(1)

V_{CC} = 5V ±10% (unless otherwise specified)

Parameter		Test Conditions	Min	Typ	Max	Units
V_{IH}	High Level Input Voltage		2.0			V
V_{IL}	Low Level Input Voltage				0.8	V
V_{OH}	High Level Output Voltage	V_{IN} = V_{IH} or V_{IL}, I_{OUT} = −20 mA	2.5	3.4		V
V_{OL}	Low Level Output Voltage	V_{IN} = V_{IH} or V_{IL}, I_{OUT} = 48 mA		0.3	0.5	V
V_T	Differential Output Voltage	R_L = 100 Ω See(2)	2.0	3.1		V
$\lvert V_T\rvert - \lvert \overline{V}_T\rvert$	Difference In Differential Output	R_L = 100 Ω See(2)			0.4	V
V_{OS}	Common Mode Output Voltage	R_L = 100 Ω See(2)		2.0	3.0	V
$\lvert V_{OS} - \overline{V}_{OS}\rvert$	Difference In Common Mode Output	R_L = 100 Ω See(2)			0.4	V
I_{IN}	Input Current	V_{IN} = V_{CC}, GND, V_{IH}, or V_{IL}			±1.0	µA
I_{CC}	Quiescent Supply Current	I_{OUT} = 0 µA, V_{IN} = V_{CC} or GND V_{IN} = 2.4V or 0.5V(3)		200 0.8	500 2.0	µA mA
I_{OZ}	TRI-STATE Output Leakage Current	V_{OUT} = V_{CC} or GND, Control = V_{IL}		±0.5	±5.0	µA
I_{SC}	Output Short Circuit Current	V_{IN} = V_{CC} or GND See(2) and (4)	−30		−150	mA
I_{OFF}	Power Off Output Leakage Current	V_{CC} = 0V, See(2): V_{OUT} = 6V			100	µA
		V_{OUT} = −0.25V			−100	µA

(1) Unless otherwise specified, min/max limits apply across the −40°C to 85°C temperature range. All typicals are given for V_{CC} = 5V and T_A = 25°C.
(2) See EIA Specification RS-422 for exact test conditions.
(3) Measured per input. All other inputs at V_{CC} or GND.
(4) This is the current sourced when a high output is shorted to ground. Only one output at a time should be shorted.

Switching Characteristics(1)

V_{CC} = 5V ±10%, t_r, t_f ≤ 6 ns (Figure 3, Figure 4, Figure 5, Figure 6)

Parameter		Test Conditions	Min	Typ	Max	Units
t_{PLH}, t_{PHL}	Propagation Delay Input to Output	S1 Open		6	11	ns
Skew	See(2)	S1 Open		0.5	3	ns
t_{TLH}, t_{THL}	Differential Output Rise And Fall Times	S1 Open		6	10	ns
t_{PZH}	Output Enable Time	S1 Closed		12	25	ns
t_{PZL}	Output Enable Time	S1 Closed		13	26	ns
t_{PHZ}	Output Disable Time(3)	S1 Closed		4	8	ns
t_{PLZ}	Output Disable Time(3)	S1 Closed		6	12	ns
C_{PD}	Power Dissipation Capacitance(4)			100		pF
C_{IN}	Input Capacitance			6		pF

(1) Unless otherwise specified, min/max limits apply across the −40°C to 85°C temperature range. All typicals are given for V_{CC} = 5V and T_A = 25°C.
(2) Skew is defined as the difference in propagation delays between complementary outputs at the 50% point.
(3) Output disable time is the delay from the control input being switched to the output transistors turning off. The actual disable times are less than indicated due to the delay added by the RC time constant of the load.
(4) C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V^2CC f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

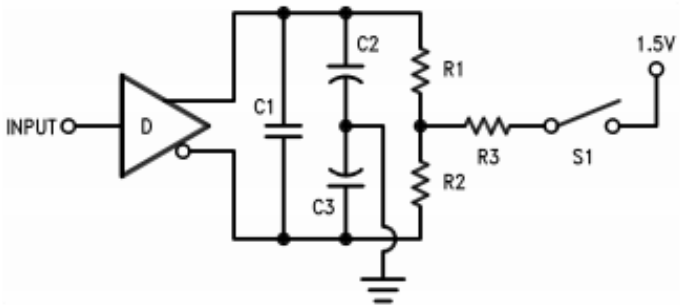
Comparison Table of Switching Characteristics into "LS-Type" Load(1)

V_{CC} = 5V, T_A = +25°C, t_r ≤ 6 ns, t_f ≤ 6 ns (Figure 6, Figure 7, Figure 8, Figure 9, Figure 10, Figure 11)

Parameter		Test Conditions	DS34C87		DS3487		Units
			Typ	Max	Typ	Max	
t_{PLH}, t_{PHL}	Propagation Delay Input to Output		6	10	10	15	ns
Skew	See(2)		1.5	2.0			ns
t_{THL}, t_{TLH}	Differential Output Rise and Fall Times		4	7	10	15	ns
t_{PHZ}	Output Disable Time See(3)	C_L = 50 pF, R_L = 200Ω, S1 Closed, S2 Closed	8	11	17	25	ns
t_{PLZ}	Output Disable Time See(3)	C_L = 50 pF, R_L = 200Ω, S1 Closed, S2 Closed	7	10	15	25	ns
t_{PZH}	Output Enable Time	C_L = 50 pF, R_L = ∞, S1 Open, S2 Closed	11	19	11	25	ns
t_{PZL}	Output Enable Time	C_L = 50 pF, R_L = 200Ω, S1 Closed, S2 Open	14	21	15	25	ns

(1) This table is provided for comparison purposes only. The values in this table for the DS34C87 reflect the performance of the device but are not tested or ensured.
(2) Skew is defined as the difference in propagation delays between complementary outputs at the 50% point.
(3) Output disable time is the delay from the control input being switched to the output transistors turning off. The actual disable times are less than indicated due to the delay added by the RC time constant of the load.

AC TEST CIRCUIT AND SWITCHING TIME WAVEFORMS



Note: C1 = C2 = C3 = 40 pF (including Probe and Jig Capacitance), R1 = R2 = 50Ω, R3 = 500Ω

Figure 3. AC Test Circuit

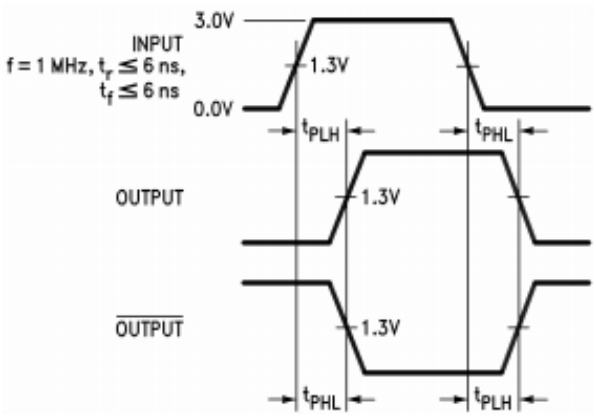


Figure 4. Propagation Delays

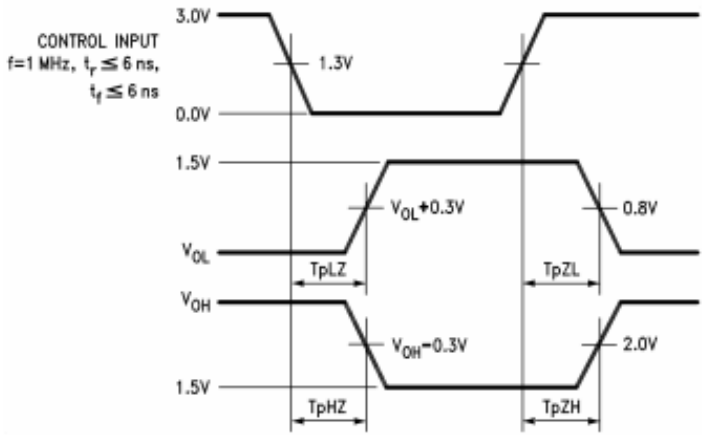
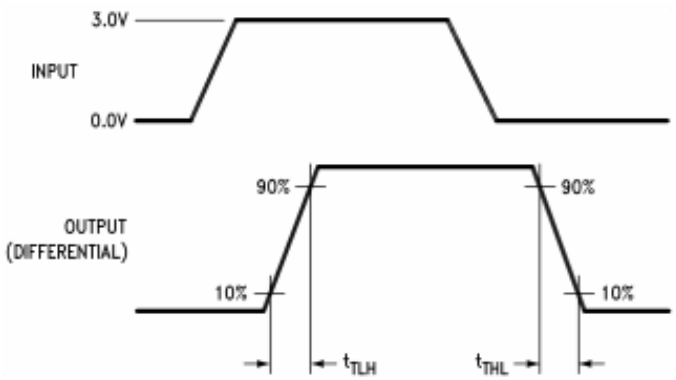


Figure 5. Enable and Disable Times



Input pulse; f = 1 MHz, 50%, $t_r \leq 6$ ns, $t_f \leq$ 6ns

Figure 6. Differential Rise and Fall Times

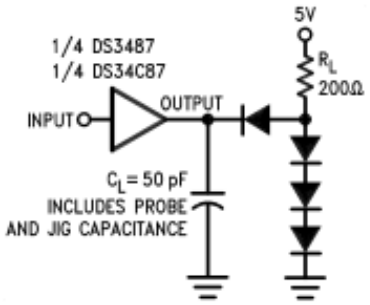


Figure 7. Propagation Delays Test Circuit for "LS-Type" Load

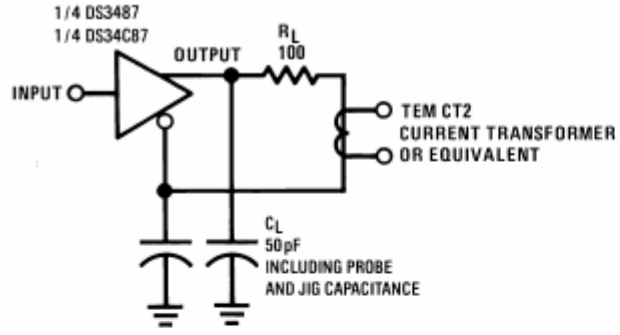


Figure 8. Differential Rise and Fall Times Test Circuit for "LS-Type" Load

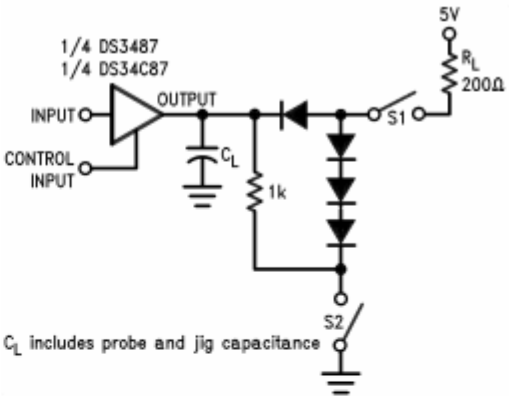


Figure 9. Load Enable and Disable Times Test Circuit for "LS-Type" Load

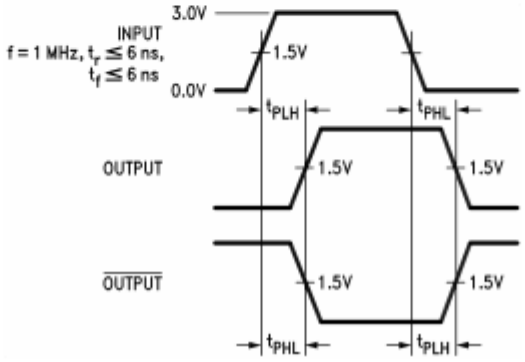


Figure 10. Load Propagation Delays for "LS-Type" Load

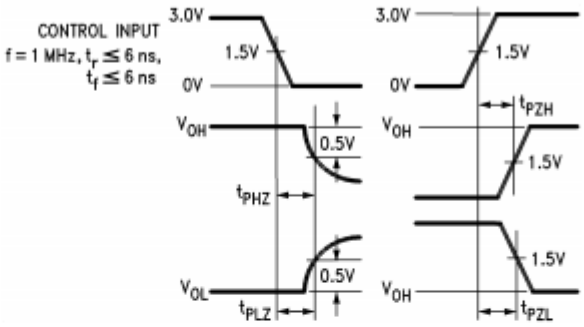
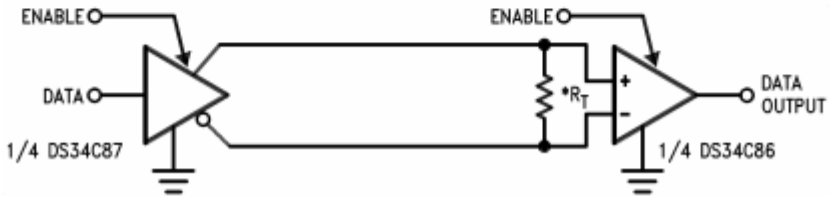


Figure 11. Load Enable and Disable Times for "LS-Type" Load

TYPICAL APPLICATIONS



*R_T is optional although highly recommended to reduce reflection.

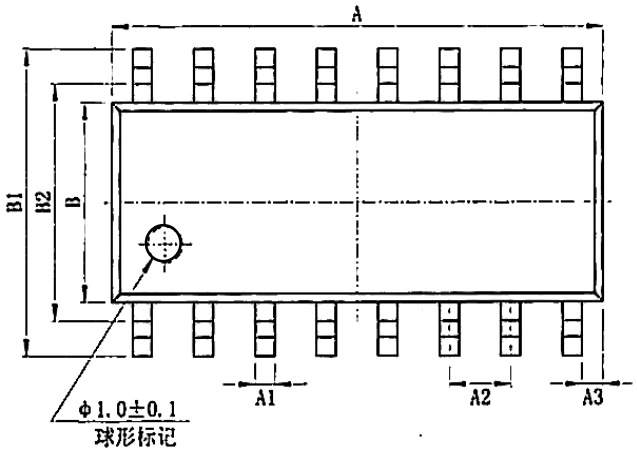
PIN DESCRIPTIONS

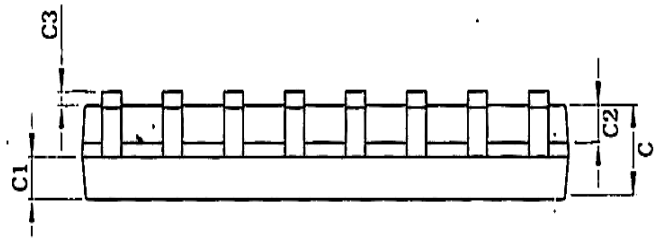
Pin Number (PDIP or SOIC package)	Pin Name	Function
1	INPUT A	Channel A - TTL/CMOS input
2	OUTPUT A - True	True Output for Channel A, RS422 Levels
3	OUTPUT A - Inverting	Inverting Output for Channel A, RS422 Levels
4	A/B CONTROL	Enable Pin for Channels A and B, Active High, TTL/CMOS Levels
5	OUTPUT B - Inverting	Inverting Output for Channel B, RS422 Levels
6	OUTPUT B - True	True Output for Channel B, RS422 Levels
7	INPUT B	Channel B - TTL/CMOS input
8	GND	Ground Pin (0 V)
9	INPUT C	Channel C - TTL/CMOS input
10	OUTPUT C - True	True Output for Channel C, RS422 Levels
11	OUTPUT C - Inverting	Inverting Output for Channel C, RS422 Levels
12	C/D CONTROL	Enable Pin for Channels C and D, Active High, TTL/CMOS Levels
13	OUTPUT D - Inverting	Inverting Output for Channel D, RS422 Levels
14	OUTPUT D - True	True Output for Channel D, RS422 Levels
15	INPUT D	Channel D - TTL/CMOS input
16	V_{CC}	Power Supply Pin, 5.0V typical

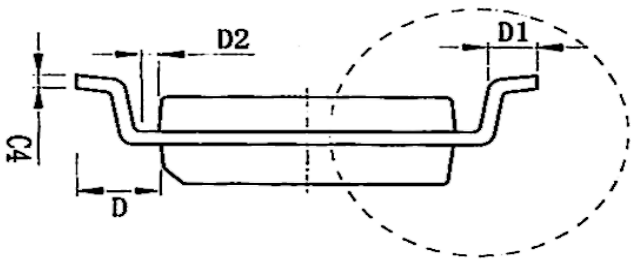
Order information

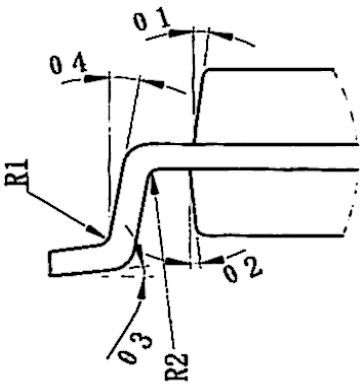
Order Number	Package	Package Quantity	Marking On The park
DS34C87TMX/NOPB-TUDI	SOP16	Tape,Reel,2500	DS34C87TMX/NOPB
DS34C87TN-TUDI	DIP16	Tube,25,A box of 1000	DS34C87TN

Package SOP16



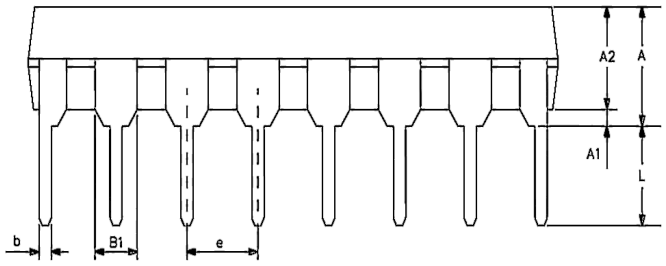


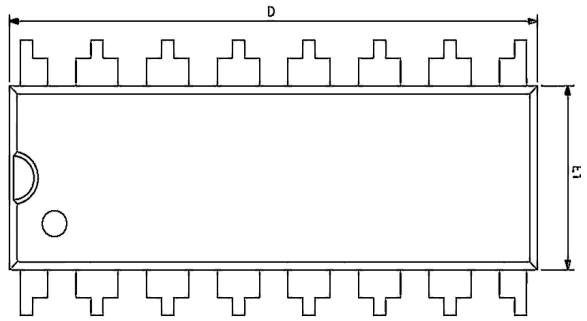


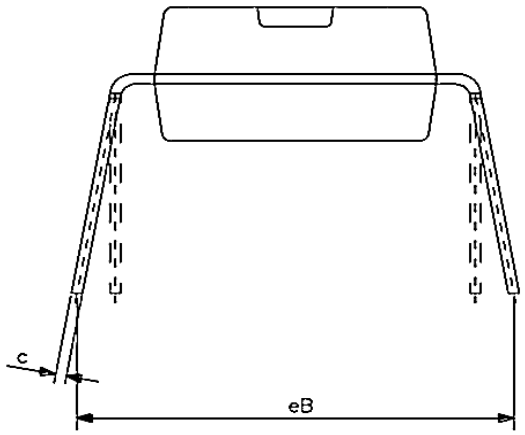


SIZE / SYMBOL	MIN./mm	MAX./mm
A	9.80	10.00
A1	0.356	0.456
A2	1.27TYP	
A3	0.302TYP	
B	3.85	3.95
B1	5.84	6.24
B2	5.00 TYP	
C	1.40	1.60
C1	0.61	0.71
C2	0.54	0.64
C3	0.05	0.25
C4	0.203	0.233
D	1.05 TYP	
D1	0.40	0.70
D2	0.15	0.25
R1	0.20TYP	
R2	0.20TYP	
01	8°~12°TYP4	
02	8°~12°TYP4	
03	0°~8°	
04	4°~12°	

Package DIP16







SIZE / SYMBOL	MIN./mm	MAX./mm
A2	3.20	3.60
A1	0.51	___
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
C	0.20	0.36
eB	7.62	9.30
R	0.20TYP	
R1	0.30TYP	
θ	0°	8°
θ1	45°TYP	
02	12°TYP	
03	0°	8°
04	0°	10°

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